

The Infinity Pool

Abraham Loeb

Career opportunities are often a matter of chance, but also of willingness to cross interdisciplinary boundaries.

Recently, my family and I visited Las Casitas village in Puerto Rico which features an “infinity pool”. When you enter the pool, you see the blue ocean behind it meshing smoothly with the pool’s water surface as well as with the blue sky above it (see image below). The boundaries between these entities are blurred, leaving the viewer with a sense of freedom to navigate through the continuum of blended shades of blue. This relaxing view led me to the realization that much of the tension in our professional life originates from boundaries, protected by gatekeepers that limit access across them. In my personal case, I was fortunate to cross the boundary between the humanities and sciences thanks to the kindness of a few gatekeepers. The pool of opportunities is infinite, and the talents of an individual can be realized equally well in completely different disciplines. Creative freedom is all about adopting the infinity pool’s point of view, blurring the significance of interdisciplinary boundaries and continuing to create professionally despite the “localized” opinions of some gatekeepers.

I originally wished to be a philosopher, not a physicist. But being born in Israel, I was obligated to serve in the military in 1980 when I turned 18. Philosophy appealed to me since it addressed the most fundamental questions, but I was also good in physics. And so I was fortunate to be selected for the prestigious Talpiot program which had been established a year earlier and whose goal was to enable a group of two dozen recruits per year to pursue intellectual work in defense-related research in place of the standard military service. This sounded closer to philosophy than running in the field as a regular soldier. I felt privileged to have been selected to this elite group and did my best to justify it. Following three years of military training and undergraduate studies, we were asked to pursue work on military or industry projects with immediate practical applications. But because of my love of philosophy I was driven to pursue creative intellectual work which was not abundant in these work environments. I visited a research center which was not on the list of official work places available to us. Following the visit, I used a typewriter to produce a formal-looking document outlining a research project based on some handwritten notes on oil-stained paper that was handed to me during a lunch meeting by Shalom Eliezer, who later became my PhD advisor. As a result, this *outside of the box* research proposal was approved at first for a trial period of three months and later for the remaining five years of my military service between 1983-1988. I was given some slack by the higher authorities because I had excelled early on during my military training. Following a conversation with an experimentalist, Zvi Kaplan, my research evolved quickly in a new

direction, employing a full department, and was the first project to receive international funding from the Strategic Defense Initiative (SDI) in the US. The US-based funding meant that I visited Washington D.C. every few months.

I completed my PhD in plasma physics a couple of years before the end of my compulsory service and wondered what to do afterwards. One evening, during a bus ride back from work, I brought up this issue with a colleague, Arie Zigler, and he mentioned that the most prestigious postdoc fellowships at that time were awarded by the Institute for Advanced Study (IAS) at Princeton, where Einstein worked late in his career. During a subsequent visit to the US, I attended a conference in Austin, Texas, and met Marshall Rosenbluth who was a faculty member at IAS two decades earlier. I asked Marshall if he would recommend that I visit IAS. Marshall's answer was a definite "Yes". I immediately called Michelle Sage, the administrative officer at IAS, and asked if I could visit that coming week. She replied: "We do not allow just anyone to visit us. Please send me a copy of your CV and I will let you know if you can visit". I mailed her a list of 11 publications which I had handy and called her again a few days later. This time she gave me permission to visit, and scheduled the visit on a Friday at the end of my trip. When I arrived to her office early in the morning that day, Michelle said: "There is one faculty member here with available time, Freeman Dyson. Let me introduce you to him." I was thrilled since I remembered Dyson's name from textbooks on Quantum Electrodynamics. When I met Freeman in his office, he said: "Oh, you are from Israel. Do you know John Bahcall?" I said: "No, I have never heard of him". Freeman said: "Let me introduce you to him. John likes Israelis. He is married to one". Fortunately, John was in his office that morning and we had lunch together. When he heard that Rosenbluth advised me to visit, he suggested that I visit again for a month in spring 1987, and so I did. In the meantime John contacted Yuval Ne'eman, the most prominent Israeli physicist at the time, and asked for more information about me. Yuval inquired about me and sent a positive report back to John. At the end of my second visit, John invited me to his office and said: "We would like to offer you a five year position if you switch to astrophysics, but to formally make this offer I need you to arrange for two recommendation letters". I was extremely excited and as I ran down the stairs in E-building which hosted the astrophysicists at IAS, I saw David Spergel, who had just started the first year of his postdoc fellowship there. I told David that John had just made me an offer, and he replied: "How is that possible?! The five-year members are supposed to meet with John this afternoon and discuss the candidates". When they did, John asked them: "Avi looks promising; should we make him an offer?". So once again, I had an offer that I could not decline, even though I really wanted to get back to my old love of philosophy.

After three years at IAS, I was encouraged to apply to junior faculty positions, including one at the Harvard Astronomy department. Eventually Harvard made an offer to another candidate who declined the position presumably because the prospects for tenure were slim based on the fact that the previous person who received tenure from within Harvard Astronomy was Josh Grindlay, a couple of decades earlier. As a result, I received the offer - which I gladly accepted because in case of not receiving tenure I could always go back to my father's farm and work there. After all, I

was used to collecting eggs every afternoon growing up as a child in that farm. I arrived at Harvard in February 1993.

Three years later, my collaborator Fred Rasio encouraged me to apply to a faculty position at Cornell university. I did not know anyone at Cornell but decided to apply since the prospects for tenure at Harvard were unclear. To my surprise, I received an offer for a tenured appointment at Cornell, and when I mentioned this offer at Harvard it was clear that I needed to decide whether to accept or decline the Cornell offer before Harvard could decide whether to tenure me. I arranged a meeting with the wisest person on campus, Henry Rosovsky, a former dean of the Faculty of Arts & Sciences. Henry asked for some background information and then advised: “Stay at Harvard”. I declined the offer from Cornell and six months later, in December 1996, I received tenure at Harvard.

At that point, it was too late to return to philosophy as my day job, since I was immersed in an intense research program. Around the same time, I realized that this arranged marriage was actually to my old love, dressed up in different clothes. In other words, I figured that astronomy addresses questions that were previously in the realm of philosophy or religion, such as: *How did the universe start?* and *What is the origin of life?*. Therefore, I actually have the privilege of addressing philosophical questions using modern scientific means. In addition, being a theorist rather than an observer makes me less vulnerable to outside circumstances that are beyond my control, such as bad weather, allocation of observing time on telescopes, or long delays in the construction of suitable instruments. Instead, I can wake up in the morning with an inspiration for a new idea that was never considered before and flesh it out to a full paper the same day.

Fifteen years later, the time came to appoint a new Chair to the Harvard Astronomy department. Another faculty member was offered the job and declined, so I was offered this job. And three years later my service was extended to a second three-year term.

The barriers I had to overcome through my unusual career path taught me freedom in my choice of research topics and diversity in my selection of collaborators. Interdisciplinary paths often share the fate of rare seashells swept to the shore which are eroded over time by ocean waves into indistinguishable sand grains as if they never existed, unless someone picks them up and preserves them.

Throughout my career, there were several junctions where I could have been diverted to less fortunate paths. Some of the main opportunities that benefited me arrived by pure chance. Since things could have turned out differently, there must be many “Loebs” out there with similar qualifications who did not have these opportunities. With this in mind, I am deeply committed to help young researchers fulfill their potential.

About a decade ago, I moved to my current home and discovered a broken branch on a young tree in the yard. The gardener recommended cutting off the branch, but close inspection revealed that living fibers were still linking the branch to the tree and so I chose to tie the branch to the tree with an insulation tape. Today the branch rises to the sky far above my height, but the insulation

tape is still visible at my eye level. Every month I stare at the robust branch whose base swallowed the insulation tape in a slow kiss that lasted years, and think how important it is to strengthen young researchers at the fragile beginning of their career.

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Image credit: The infinity pool, Las Casitas Village, Puerto Rico (A. Loeb, July 5, 2015).

